Grooming in Polistes exclamans (Viereck), a Forerunner of Communications in Social Hymenoptera

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ABSTRACT

The behavior pattern in a nest of *Polistes exclamans* (Viereck) is described, and colony development before and afterwards is recorded. Similarity of this behavior to the dance of the honeybee suggests that this behavior may be a forerunner to communicative dancing as found in the honeybee.

In July 1971, I was fortunate enough to observe a behavior pattern in a nest of *Polistes exclamans* (Viereck) not unlike communicative dancing on the comb of the honey bee, *Apis mellifera* L. The events observed and colony development before and after the event are herein described.

In the vicinity of Silver Spring, Maryland, some *P. exclamans* come out of hibernation as early as February 7, but most probably do not survive, although I saw one queen out of hibernation on February 18, 1971. Thus the queen that built the nest over the east door of the North Building, Plant Industry Station at Beltsville, Md., probably left hibernation some time in March or early April. I first noted the nest May 14; it was on a cornice over the upper righthand corner, about 45 inches above the actual swinging door (which swings inward). The nest contained 4 cells; by May 27, it had 15 cells. On June 8, there were 20 cells, and two of these were capped, indication of prepupae or pupae within. The queen spent quite a bit of time June 8 near the capped cells. Then, between 1:15 p.m. EDST and 2:05 p.m., the first worker emerged. By July 13, at least 8 workers and the queen were present; by July 20, there were at least 11 workers.

During the week of July 13 to July 20, on five different occasions, one or more of the wasps performed a "waggle dance" similar to that commonly performed by honey bees. For the record, my notes on those occasions are given here in their entirety:

"July 13–At 7:55 a.m., EDST, 8 on nest. At 9:05 a.m., 6 on cells, 1 behind nest, all fairly quiet. At 11:50 a.m., 8 or 9 on nest, very active. As I watched, 1 arrived, apparently carrying no meat. She performed a "waggle dance" like a honey bee, oriented towards 1 o'clock [6 o'clock was toward the building]. She repeated the "dance" twice more, circling each time to the same initial position and then preened or groomed herself. So far as I could tell, the dance drew no attention from her sister wasps.

"July 15–At 8:05 a.m. EDST, 6 very active on nest. At 11:33 a.m., as I stepped out to observe, 1 wasp was doing a waggle dance towards 7 o'clock–I think she was the queen. The others paid no attention and she

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did not groom herself afterwards. Is this plea for grooming a forerunner to communication as it occurs in honey bees? At this time, I counted 7 wasps on the nest. At 4:50 p.m., I could see only 5 on the nest. Were all but the queen and 4 workers out foraging for food?

"July 16—At 8:06 a.m. EDST, at least 7 on nest. At 10:37 a.m., when I first looked, 1 finished a waggle dance and then groomed herself. At 5:33 p.m., 8 on nest and 1 behind. Two were grooming themselves and 1 did a waggle dance towards 9 o'clock and then went behind the nest."

"July 20—At 8:45 a.m. EDST, at least 12 on nest; at 11:32 a.m., while I was attempting to count, 1 arrived with meat. The meat was divided and just about every wasp (now 10 of them) promptly took a head-down position in a cell, obviously feeding larvae and doubtless getting fed in return. Several then performed the waggle dance in several different directions. Some then began preening or grooming themselves. At 5:03 p.m., I counted only 6 on the nest; this is obviously now a thriving, successful colony, with as many as 6 away from the nest at a time, hunting food or paper-making materials."

At this time, the nest was about 3 inches in diameter. It had a ring of 19 capped cells placed a bit offcenter. The ring was as narrow as 1 cell wide in places but several cells wide in other places. That there were larvae in the cells inside as well as outside the ring was evidenced by the activities of the workers in parceling out meat brought to the nest.

I was out of town between July 23 and August 30 and thus could not observe the nest during this period. By September 1, the nest was about 6 inches in diameter. There were at least 25 wasps on the nest, and a major emergence on September 7 at least doubled the number of wasps in the colony. From then until mating and dispersal began on October 13, there appeared to be no room for waggle dancing. It would appear that observance of the dancing behavior is dependent upon relatively small numbers of wasps on the nest so room is available for the activity. Yet I suspect the colony must be a successful one. It is possible that caring for the sexual brood may play a role in triggering the behavior. I made many observations before July 13 without seeing any indications of the dance. Fortunately, the nest was within a few feet of my office, and observation was not time-consuming, so I did not hesitate to dash out to look at the nest from time to time, often as many as four times a day.

Time of day did not seem to be a factor. Waggle dances were observed at 10:37 a.m. (July 16), 11:32 a.m. (July 20), 11:33 a.m. (July 15), and 11:50 a.m. (July 13), but also at 5:33 p.m. (July 16).

I saw no evidence that any direction-giving was accomplished by the dancing behavior, but grooming almost always occurred. The activity of dancing in a predatory hymenopteran was totally unexpected. However, this kind of behavior has been reported by others. Esch (1971) described the waggle dance in *Polistes versicolor vulgaris* Bequaert and reported a sound-burst at the turning point of the dance. Eberhard (1969) reported waggle dancing in *Polistes fuscatus* (Fabricius).

The opinions of the two authors concerning the significance of the dance do not agree. Esch feels it may be part of a defensive behavior, but Eberhard calls it an expression of dominance by the queen or another female that ranks high in the nest hierarchy.

Regardless of the true meaning or function of the waggle dance, if any, its similarity to the dance of the honey bee suggests that the behavior may be a forerunner to communicative dancing in the socially more fully evolved honey bee.

References Cited

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